

Confined Spaces

Los Alamos National Laboratory
Laboratory Implementation Requirements LIR 402-810-01.0
Issue Date:12/22/99

Mandatory Document

1.0 Introduction

1.1 Background

Note: [Click here](#) for lessons learned that may apply to the requirements contained in this LIR.

There are two types of confined space: permit-required confined spaces (PRCSs) and nonpermit confined spaces (NPCSSs). The elements of the LANL confined-space program (CSP) include identification and evaluation of confined spaces, posting of confined spaces, entry requirements for PRCSs and NPCSSs, requirements for emergency rescue, and training requirements.

This Laboratory implementation requirements (LIR) document specifies requirements that shall be implemented for entering and working in confined spaces. This LIR supersedes Administrative Requirement (AR) 8-1, "Confined Spaces," and complements the expectations contained in LPR 402-00-00, "Worker Health and Safety." Unless otherwise stated in the text, the requirements contained in this LIR are effective upon the issue date. Attachment D provides "Recommended Major Implementation Criteria for Self-Assessment."

1.2 Contents

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2.0 Purpose

The purpose of this LIR shall be to establish the confined-space program requirements for the Laboratory to effectively protect employees from death, injury, or illness.

3.0 Scope and Applicability

This LIR shall apply to all work performed in confined spaces on Laboratory-owned or -operated property, with the following clarifications:

- Contractors, subcontractors, and vendors who perform construction, modification, and maintenance on Laboratory-owned or -operated property shall enter confined spaces only in full compliance with this LIR or in accordance with an ESH-5-approved confined-space program for "greenfield" construction (see Section 4.2, "Terms").
- Contractors, subcontractors, and vendors who bring a mobile confined space on-site shall prevent unauthorized entry. If no one will enter the confined space while it is on Laboratory property, the posting and evaluation requirements (Sections 6.2.1 and 6.2.2) of this LIR shall not apply.

Telecommunications activities shall be conducted in accordance with 29 CFR 1910.268, "Telecommunications," and in accordance with ESH-5-approved documentation addressing operations.

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4.0 Definitions

4.1 Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity hazard analysis
AR	Administrative requirement
CFR	Code of Federal Regulations
CPR	Cardiopulmonary resuscitation
CSP	Confined-space program
EDS	Employee Development System
ESH	Environment, Safety, and Health (Division)
FOM	Field Operations Manual
HCP	Hazard control plan
IDLH	Immediately dangerous to life or health
LACFD	Los Alamos County Fire Department
LANL	Los Alamos National Laboratory
LFL	Lower flammability limit
LIR	Laboratory implementation requirement
MSDS	Material safety data sheet
NPCS	Nonpermit confined space
OIC	Office of institutional coordination
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure limit
PPE	Personal protective equipment
ppm	Parts per million
PRCS	Permit-required confined space
TLV	Threshold limit value

4.2 Terms

Acceptable entry conditions—The conditions that must exist in a confined space to allow entrant(s) to safely enter and work in the space.

Authorized employee—Any employee, including affiliates, visitors, vendors, contractors, and subcontractors and their employees, who are designated by their immediate safety-and-environmentally-responsible line manager/supervisor and are trained to perform specific duties (i.e., entry supervisor, entrant, attendant, and rescue team member).

Attendant—An authorized employee stationed outside one or more PRCS who monitors authorized entrants and performs all the duties assigned to attendants in the CSP.

Blinding or blanking—Closing a pipe, line, or duct by inserting a solid plate or cap that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct without allowing leakage into the space.

Confined space—A space that (1) is large enough and is configured so that an employee can bodily enter and perform assigned work, (2) has limited access or egress, and (3) is not designed for continuous employee occupancy. A confined space is either a PRCS or an NPCS.

Doubleblock and bleed—A method used to isolate a confined space from a line, duct, or pipe by closing two in-line valves in a piping system and opening a valve between them that is vented to a safe location.

Emergency—Any incident (including any failure of hazard control or monitoring equipment) or event inside or outside the confined space that could endanger entrants.

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Energy source—Hazardous energy sources associated with machinery, equipment, or systems, such as electricity or motive sources.

Engulfment—The surrounding and effective capture of a person by a liquid or a finely divided (flowable) solid substance, aspiration of which can cause death by filling or plugging the respiratory system or which can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entrant—An authorized employee who enters a confined space and performs work.

Entrapment—Getting trapped in a confined space that has an internal configuration, such as inwardly converging walls or a floor that slopes downward and tapers to a smaller cross section, that could trap an entrant. Entrapment also means capture by moving equipment parts, such as belts, pulleys, and gears.

Entry—The intentional or accidental action by which a person passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit—The document that allows or controls entry into a PRCS under defined conditions for a stated purpose during a specified time.

Entry supervisor—A authorized employee responsible for (1) determining whether acceptable entry conditions are present in a PRCS before authorizing entry, (2) for overseeing the confined-space operation, and (3) for terminating entry as required by the CSP.

Guidance Note: The entry supervisor also may serve as an attendant or as an entrant, as long as the entry supervisor is trained and equipped for each role as required by the CSP.

Greenfield—Refers to construction contracts under which the construction subcontractor has exclusive custody of the entire work site, and the subcontractor's personnel and lower-tier subcontractors are the only personnel affected by the confined space(s).

Hazardous atmosphere—An atmosphere that may expose entrants to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from any of the following: flammable gas, vapor, or mist in excess of 10% of its LFL; airborne combustible dust at a concentration that meets or exceeds its LFL; oxygen concentration below 19.5% or above 23.5%; a concentration of a substance that could result in entrant exposure in excess of OSHA's PEL or ACGIH's TLV (including ceiling and short-term-exposure-limit values), whichever is more stringent; or any other atmospheric condition that is IDLH.

Immediately dangerous to life or health—Any condition that poses an immediate or delayed threat to life, that would cause irreversible adverse health effects, or that would interfere with an entrant's ability to escape unaided from a confined space.

Inerting—Rendering the atmosphere in a confined space nonflammable, nonexplosive, or otherwise chemically nonreactive by displacing or diluting the original atmosphere with an inert gas such as argon or nitrogen.

Guidance Note: Inerting produces a hazardous atmosphere.

Isolation—A process whereby a confined space is removed from service and completely protected from inadvertent release of material or startup of any energy sources.

Knowledgeable person—An employee who is identified by the immediate safety-and-environmentally-responsible line manager/supervisor as knowing the actual or potential hazards present in a confined space, the functions of the confined space, and the work conducted in the confined space.

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Lockout/tagout—A procedure applied to machinery or equipment that includes the use of a combination of locks and tags to prevent death or injury of entrant(s) from an unexpected, uncontrolled release of energy (see LIR 402-860-01, "Lockout/Tagout for Personal Safety").

Lower flammability limit—The minimum concentration of fuel vapor, gas in a fuel vapor, or gaseous oxidant mixture (usually expressed as percent by volume) over which propagation of a flame will occur on contact with an ignition source.

Motive source—Powered machinery using energy sources other than electricity, such as compressed air, vacuum, water, steam, hydraulic fluid, and internal combustion.

Nonentry rescue—A rescue that is accomplished without entering the confined space by using a retrieval system.

Nonpermit confined space—A confined space that does not contain or, with respect to atmospheric hazards, have the reasonable potential to contain a primary hazard.

Oxygen-deficient atmosphere—An atmosphere that contains less than 19.5% oxygen by volume.

Oxygen-enriched atmosphere—An atmosphere that contains more than 23.5% oxygen by volume.

Permit-required confined space—A confined space that has one or more of the following inherent or introduced primary hazard characteristics:

- contains or has the potential to contain a hazardous atmosphere,
- contains a material that has the potential to engulf an entrant,
- has an internal configuration that could entrap or asphyxiate an entrant, or
- contains any other recognized serious safety or health hazards (primary hazards).

Primary hazard—Any serious physical or health hazard that can cause the death, injury, or illness of an entrant and can prevent an entrant's ability to self-rescue from a confined space. These hazards can be inherent in (intrinsic) or introduced into the confined space.

Prohibited condition—Any condition in a confined space that is not allowed by the permit for the period during which entry is authorized.

Purging—A method by which gases, vapors, or other air contaminants are displaced from a confined space.

Qualified person—An employee who has academic credentials or work experience in a relevant discipline, such as industrial hygiene or industrial safety, who has experience or training in conducting confined-space entries and who has received training from ESH-5 to establish proficiency in evaluating confined spaces.

Rescue available—A term that suggests that a rescue team is able to respond to a call for help from the attendant and arrive at the entry site in no more than 10 minutes and could then reach the entrant approximately 5 minutes later.

Rescue stand-by—Requires that a rescue team be staged at an entry site so that in an emergency it can enter the space immediately and reach the entrant within 2 to 4 minutes.

Retrieval system—The equipment (including a retrieval line, chest, or full-body harness; wristlets or anklets, if appropriate; and a lifting device or anchor) used for nonentry rescue of persons from PRCs.

Secondary hazards—Any physical or health hazard, e.g., asbestos or lead at levels below the OSHA PEL, that is unlikely to cause death, serious injury, or illness to entrants or that would not prevent the

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entrant's ability to self-rescue from the confined space. These hazards can be inherent in (intrinsic) or introduced into the confined space.

Supplied-air breathing equipment—Atmosphere-supplying respirators that provide a respirable atmosphere to the wearer independent of the ambient air. The breathing atmosphere shall be supplied from an uncontaminated source and shall conform to Compressed Gas Association Grade D purity levels. This equipment includes air-line respirators, self-contained breathing apparatus, and a combination of air-line and self-contained breathing apparatus.

5.0 Precautions and Limitations

Spaces located throughout Laboratory-owned and -operated property that meet the definition of a confined space shall be recognized as confined spaces regardless of whether identification, posting, or evaluation has occurred, including

- manholes (sewer, electrical, communications, and utilities);
- tanks (open surface and enclosed), hoppers, silos, bins, vats, boilers, and vessels;
- elevator shafts;
- crawl spaces and tunnels;
- utility pits, sumps, vaults, wells, and traps;
- ventilation ducts, fan housings, exhaust stacks, and some plenums; and
- ovens, furnaces, and mixers.

If a space is encountered that has not been posted and/or evaluated, the space shall be evaluated by a qualified person before entry.

When emergency communication equipment is needed during a confined-space-entry operation in a security area, the authorized employees shall coordinate with security before conducting operations. For more detailed information, contact S-5, Computer and Communication Security, or visit S-5's web site at [click here http://www.lanl.gov/labview/security/index.html](http://www.lanl.gov/labview/security/index.html). Emergency calls made to 911 from cellular phones reach a dispatcher located in Santa Fe; therefore, callers must indicate that the call is from Los Alamos.

6.0 Implementation Requirements

6.1 Responsibilities and Duties

Authorized employees and qualified and knowledgeable persons involved with confined-space operations shall be alert for unidentified confined spaces and report any issues to their immediate safety-and-environmentally-responsible line managers/supervisors or to ESH-5 at [click here csp@lanl.gov](mailto:csp@lanl.gov).

Individual or Organization	Shall
Immediate Safety-and-Environmentally-Responsible Line Manager/ Supervisor and Facility Managers	<ul style="list-style-type: none">• ensure that owned confined spaces are identified, evaluated, and posted by obtaining support from ESH-5 qualified persons or other qualified persons.• designate entry supervisors and qualified persons.• ensure that authorized employees who perform confined-space operations are provided training at a level commensurate with their assigned duties (see Section 6.6, "Training Requirements") and that they have the necessary equipment to conduct confined-space entry operations safely (see Section 6.5, "Equipment").• ensure that for facility work,<ul style="list-style-type: none">- for entry into an PRCS, entry permits are completed and a copy is attached to the work package.- for entry into an NPCCS, the AHA for facility work addresses the entry.

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	<ul style="list-style-type: none">• ensure that for nonfacility work,<ul style="list-style-type: none">- for entry into an PRCS, entry permits are completed (see Section 6.3.2).- for entry into an NPCCS, an HCP addresses the entry.• ensure review of confined-space entry operations when a prohibited condition arises in a PRCS or when there is any reason to believe that entrants may be at unnecessary risk (see Section 6.3, "Entry Requirements").• provide area access to the rescue service provider, when requested, to allow the rescue team to develop rescue plans and practice rescue operations.• ensure that contractors, subcontractors, and vendors who are expected to enter confined spaces in their assigned area(s) meet the requirements specified in their contract.• ensure that guards or barricades are in place to protect employees from unintentional or accidental entry into permanently open confined spaces.• authorize work in confined spaces.
Authorized Entry Supervisor for PRCS Entry	<ul style="list-style-type: none">• know the hazards that may be encountered during PRCS entry, including information on the mode, signs or symptoms, and consequences of an exposure.• verify that rescue services are available and that the means for summoning them are operable (see Section 6.4, "Emergency Rescue Requirements").• verify that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before authorizing the permit and allowing entry to begin.• ensure that measures, such as guarding and barricading, are taken to protect employees from unintentional or accidental entry into confined spaces that are temporarily open.• remove unauthorized individuals who attempt to enter or enter the space during entry operations.• ensure that entry operations remain consistent with the terms of the permit and that acceptable entry conditions are maintained throughout an authorized entry.• terminate the entry and cancel or suspend the entry permit.
Authorized Entrants for PRCS Entry	<ul style="list-style-type: none">• know the hazards that may be encountered during PRCS entry, including information on the mode, signs or symptoms, and consequences of an exposure.• use confined-space equipment as trained.• communicate with the attendant to enable him/her to monitor the entrant's(s') status and to alert the entrant(s) of the need to evacuate the space.• alert the attendant whenever any warning sign(s) or symptom(s) of exposure are recognized or a prohibited condition is detected.• exit the space as quickly as possible whenever the attendant or entry supervisor gives an order to evacuate, when any warning sign or symptom of exposure to a dangerous situation is recognized, when a prohibited condition is detected, or when an evacuation alarm is activated.
Authorized Attendant for PRCS Entry	<ul style="list-style-type: none">• know the hazards that may be encountered during PRCS entry, including information on the mode, signs or symptoms, and consequences of an exposure.• be aware of the possible behavioral effects of hazard exposure on entrants.• continuously maintain an accurate count of entrants in the space and ensure that the means used to identify entrants accurately identifies who is in the space throughout entry operations.• remain outside the space during entry operations until relieved by another authorized attendant; monitor activities inside and outside the space; and communicate with entrant(s) to monitor the entrant's(s') status and to alert the entrant(s) of the need to evacuate the space.• order entrant(s) to evacuate the space immediately if (1) a prohibited condition arises, (2) behavioral effects of exposure are detected, (3) a situation arises outside the space that could endanger entrant(s), or (4) the attendant cannot effectively perform all required duties.

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	<ul style="list-style-type: none"> • summon rescue services (call 911) as soon as it has been determined that entrant(s) will need assistance to escape. • warn unauthorized persons to stay away from the space during entry operations; advise unauthorized persons to exit immediately if they have entered the space and notify the entry supervisor. • perform nonentry rescue as specified by the entry permit. • perform no duties that might interfere with the primary duties of monitoring and protecting entrant(s). • An attendant shall enter the space to perform rescue <u>only</u> if he/she has been trained and equipped for rescue (Section 6.4, "Emergency Rescue Requirements," and Section 6.6, "Training Requirements") and <u>only</u> if he/she has been relieved by another authorized attendant.
Rescue Services Provider (LACFD)	<ul style="list-style-type: none"> • be available to support entries upon request. • maintain the required PPE and rescue equipment needed to conduct rescues safely and train rescue team members in the use of the PPE and equipment. • train rescue team members to perform assigned rescue duties. • train rescue team members as authorized entrants (see Section 6.6, "Training Requirements"). • train rescue team members in first aid and CPR and ensure that at least one member of the rescue team is currently certified. • ensure that rescue team members practice rescues annually in actual or representative confined spaces, removing dummies or actual persons and using the equipment normally deployed during a rescue.
Industrial Hygiene and Safety Group (ESH-5)	<ul style="list-style-type: none"> • establish and maintain a confined-space inventory and evaluation database. • provide support to ESH-13 for establishing and evaluating the training required by this LIR. • review and approve CSPs for subcontractors performing greenfield construction and documentation addressing telecommunications activities. • develop and maintain the FOM. • review procedures for alternate entry methods, as requested. • revise the CSP when there is reason to believe that measures taken under the CSP may not protect entrants and correct deficiencies before subsequent entries are authorized. • review the CSP annually using cancelled permits, documenting the review, and revising the CSP, as necessary to ensure continuous improvement of the CSP. • coordinate and document the annual performance evaluation of the rescue service provider's proficiency with rescue tasks and equipment. • provide training for confined space qualified persons. • provide qualified persons to identify, evaluate and post confined spaces in accordance with ESH-5 procedures. <p>Guidance Note: Organizations may use a qualified person that is part of the organization to identify, evaluate and post confined spaces in accordance with ESH-5 procedures.</p>
Health Physics Group (ESH-1)	<ul style="list-style-type: none"> • assist in assessing and evaluating radiological hazards during confined-space evaluations and entry operations.
ESH Training Group (ESH-13)	<ul style="list-style-type: none"> • schedule and present awareness-level training "Introduction to Hazard Communication" and "Confined-Space Awareness."
Group Management and Administration (BUS-5)	<ul style="list-style-type: none"> • when entry into confined spaces is necessary, ensure that the contractual provisions of contractor, subcontractor, and vendor health and safety plans include requirements for implementing this LIR. • should a prohibited condition arise during a PRCS entry or should a primary hazard arise during an NPCCS entry, ensure that the contractor is debriefed. • request ESH review and approval of a contractor, subcontractor, or vendor CSP

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	<p>for greenfield work.</p> <ul style="list-style-type: none">• ensure that purchases of air-monitoring, rescue, and other equipment used in confined spaces are conducted in accordance with BUS-5 procurement requirements.• ensure that contractors, subcontractors, and vendors, before entry, obtain information from the ES&H Hazards and Control form (Form 1692) regarding confined-space hazards and entry, if facility work, or from the host organization if nonfacility work.• ensure that contractors, subcontractors, and vendors inform the immediate safety-and-environmentally-responsible line manager/supervisor of any hazards confronted or created during the entry operation immediately or at a debriefing.
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6.2 General Requirements

6.2.1 Identification and Evaluation of Confined Spaces

All confined spaces on LANL-owned or -operated property shall be identified and evaluated by a qualified person accompanied by a knowledgeable person in accordance with ESH-5 procedures.

The evaluation shall specify the confined-space classification, which must result in one of the following three possible classifications:

- the space is not a confined space,
- the space is a NPCS, or
- the space is a PRCS.

6.2.2 Posting Confined Spaces

All spaces evaluated on LANL-owned or -operated property shall be tagged by a qualified person with a CSP number that uniquely identifies the space. This CSP number shall correlate with all documentation associated with the space. The qualified person shall post the appropriate warning sign(s) at or near the entry to the NPCS or PRCS or shall ensure that the space is posted by the immediate safety-and-environmentally-responsible line manager/supervisor and facility manager. The owning organization shall maintain a list of those confined spaces that cannot be posted.

Guidance Note: For evaluated spaces that are determined not to be a confined space, a sign stating “not a confined space” may be posted at the entry.

6.3 Entry Requirements

Authorized entrants shall refuse to enter any confined space that they consider unsafe and shall exit a confined space that in their sole opinion has become unsafe without fear or reprisal from management. All authorized employees must receive the required training (see Section 6.6, “Training Requirements”) before entering any confined space on LANL-owned or -operated property.

All confined-space entries on Laboratory-owned or -operated property shall be coordinated with the responsible facility manager or designee. Authorized employee(s) shall obtain the confined-space evaluation report at [click here http://eshdb.lanl.gov/cgi-bin/esh5/csp/csp_system](http://eshdb.lanl.gov/cgi-bin/esh5/csp/csp_system) (or request the report from [click here csp@lanl.gov](mailto:csp@lanl.gov)) for the confined space that they will be entering and shall ensure that the information contained in the evaluation is accurate. They shall report any updates, corrections, or deficiencies to ESH-5 at [click here csp@lanl.gov](mailto:csp@lanl.gov).

Guidance Note: The NPCS entry process flow chart, Attachment A, shows the process for NPCS. The PRCS Entry Process Flow Chart, Attachment B, shows the process for PRCS entry.

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Guidance Note: Other work permits (radiation work permit, spark/flame permit, etc.) may also be required to control hazards before entry.

6.3.1 Nonpermit Confined Space

An NPCS shall be subject to reclassification to a PRCS if there are changes in the use or configuration that might increase the hazards to entrants. Before entry is made, the evaluation shall be reviewed to ensure that no actual or potential primary hazards are present. If actual or potential primary hazards are identified, the entry must be conducted as a PRCS entry. The authorized employee(s) shall ensure that a copy of the evaluation report for the NPCS is available to all entrants at the point of entry into the confined space. If air monitoring is performed, the results shall be made available for inspection by all entrants.

Guidance Note: The atmospheres of NPCSSs should be monitored before the spaces are entered, particularly spaces that potentially contain or could develop hazardous atmospheres (low-lying regions) or that are entered infrequently.

When entry operations have been completed, the space shall be closed off and/or brought to a safe condition. If a primary hazard or any other serious issue that places the entrant(s) at unnecessary risk occurs during entry, the entrant(s) shall evacuate the space immediately, terminate entry, and close off the space and/or bring it to a safe condition. The entrant(s) shall contact a qualified person to reevaluate the space and review the entry operation before reentry occurs.

6.3.2 Permit-Required Confined Space

Guidance Note: A graded approach to PRCS entry is available. Alternate entry methods for PRCSs are allowed, provided that all of the requirements in Attachment C are met.

An authorized employee shall complete a confined-space-entry permit before entry by using the evaluation report to clearly identify all known and potential hazards and to specify clear, acceptable entry conditions. Entry permits shall be obtained from ESH-5. Before entry begins, the entry supervisor shall sign and authorize the entry permit.

All efforts shall be made to eliminate or control atmospheric hazards before entry by purging, inerting, flushing, or ventilating the space. Acceptable entry conditions shall be verified throughout the duration of the authorized entry. Hazards outside the confined space, such as vehicular traffic, shall also be mitigated before entry. Rescue services shall be arranged before entry by contacting the LACFD.

Authorized employee(s) shall review current confined-space conditions and conduct entry operations as follows:

- Before authorization, conditions in the space shall be tested to ensure that acceptable entry conditions exist. If the space is large or part of a continuous system, preentry testing shall be performed to the extent feasible.
- For a continuous system (i.e., sewer system) that cannot be isolated, continuous air monitoring and forced-air ventilation are required.
- Monitoring during testing for atmospheric hazards shall be conducted by using a calibrated, direct-reading instrument and shall be conducted in the following sequence:
 - oxygen content (%) (direct reading),
 - combustible gases and vapors (% LFL) (direct reading), and
 - toxic air contaminants potentially present or generated.
- The evaluation report, entry permit, and any other work permits or supporting documentation (e.g., MSDSs or preentry sampling results) shall be made available for inspection by all authorized employees at the site of entry.

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All air monitoring shall be performed by authorized employees who have demonstrated proficiency with the calibrated equipment to be used (see Section 6.6, "Training Requirements"). Organizations that have a regular need for air monitoring shall have trained employees and proper equipment to perform this task.

Guidance Note: ESH-5 will perform air monitoring as a service for organizations that have only occasional need for this assistance.

During entry operations, authorized employees shall test or monitor to determine whether acceptable entry conditions are being maintained in the areas where entrants are working. Entrant(s) shall have an opportunity to observe any subsequent monitoring and testing of the space and to request reevaluation of the space if they conclude that the earlier evaluation was not adequate. An authorized attendant shall be stationed outside the space and shall maintain communications with the entrant(s) for the duration of the entry operation.

Guidance Note: Attendants may be assigned to monitor more than one PRCS, provided that they can effectively perform all duties assigned for each PRCS to be monitored (see Section 6.1, "Roles and Responsibilities").

The duration of the permit shall not exceed the time required to complete the job identified by the permit. When entry will occur over numerous work shifts, the entry supervisor shall take into account the possibility that conditions in the space may change between work shifts and shall account for this in the entry permit.

If a prohibited condition arises at any time during the entry operation, work shall be stopped immediately, and all authorized entrants shall exit the space. The entry supervisor shall then terminate the entry, close off the space and/or bring it to a safe condition (e.g., cover openings), immediately suspend the entry permit, and notify ESH-5 at [click here csp@lanl.gov](mailto:csp@lanl.gov). An authorized employee shall also cancel rescue services by notifying the LACFD. Entry shall resume only following a reassessment of the entry operation that involves all authorized employees and qualified persons involved with the entry. A new entry permit shall be required for reentry.

When entry operations have been completed, the entry supervisor shall terminate the entry, cancel the entry permit, and ensure that the space is closed off and/or brought to a safe condition. The entry supervisor shall send the cancelled entry permit to ESH-5 at MS K494. If rescue-available service is being used (see Section 6.4, "Emergency Rescue Services"), an authorized employee shall contact the LACFD rescue team and notify the team that the entry has been terminated and services are no longer required.

Entry operations shall be reviewed by ESH-5 and by all authorized employees and qualified persons involved with the entry when there is reason to believe that a deficiency of the CSP may have placed entrants at unnecessary risk during the entry. If deficiencies are found, ESH-5 shall review the CSP to correct deficiencies before subsequent entries are authorized. Authorized employees shall contact ESH-5 at [click here csp@lanl.gov](mailto:csp@lanl.gov) to report deficiencies.

Guidance Note: Examples of deficiencies requiring review of the CSP may include but are not limited to unauthorized entry, detection of a hazard not identified by the permit, detection of a prohibited condition, and complaints about the effectiveness of the CSP.

6.4 Emergency Rescue Requirements

For all PRCS entries, a rescue planning and response mode shall be selected on the entry permit before entry is authorized. The preferred mode of rescue service shall be rescue-available, combined with the use of nonentry rescue equipment, unless the retrieval system would increase the overall risk of entry or would not contribute to the rescue of the entrant. The following subsections shall be used to determine the rescue planning and response mode required for entering a PRCS:

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Rescue available (on-call) shall apply to PRCSS		Rescue stand-by (on-site) shall apply to PRCSS in which
that do not require the entrant(s) to wear supplied-air breathing equipment,		entrant(s) are required to use supplied-air breathing equipment,
that do not expose the entrant(s) to any obvious or potential IDLH hazard.		an obvious IDLH hazard exists or potentially exists,
from which entrant(s) can self-rescue (exit the space with no assistance) under normal conditions,		entrant(s) are expected to have difficulty with self-rescue, and/or
that do not necessitate the continuous presence of rescue personnel during the entry, and		nonentry rescue equipment cannot be effectively used.
that are configured so that nonentry rescue equipment can be used effectively.		_____

LACFD shall provide all *rescue-available* (on-call) and *rescue stand-by* (on-site) services. ESH-5 shall grant variances to organizations that have a need for an on-site rescue team. On-site rescue teams shall be trained and equipped and shall meet all the requirements for rescue services defined in 29 CFR 1910.146.

- Arrangements for *rescue-available* service shall be made by contacting the LACFD 24 hours before a PRCSS is entered. For urgent PRCSS entries (e.g., emergency utilities repair) the LACFD shall be notified immediately so the necessary rescue support can be provided. If an emergency occurs during the entry, the LACFD rescue team shall be summoned by calling 911.
- Arrangements for *rescue stand-by* service shall be made in advance of the PRCSS entry to allow for entry site inspection and planning. To effect a rescue in a timely manner, the rescue team shall prepare before the entry by assessing the hazards, deciding a strategy, making assignments to team members, and prerigging necessary equipment. No PRCSS entry requiring *rescue stand-by* service shall occur until LACFD grants final approval on the permit and the rescue team is on-site.

6.5 Equipment

Immediate safety-and-environmentally-responsible line managers/supervisors whose authorized employees perform confined-space entries shall provide (at no cost to employees) the equipment required to conduct safe confined-space entry operations, maintain the equipment in accordance with manufacturers' directions, and ensure that it is used as directed.

Guidance Note: ESH-5 maintains a limited inventory of confined-space equipment. This equipment is available for loan to organizations that have an occasional need. ESH-5 is also available to assist in selecting the required equipment.

6.6 Training Requirements

Organizations shall ensure that all authorized employees who have assigned duties under the CSP are trained to acquire the understanding, skills, and knowledge required for performing their assigned duties safely. Training shall be revised periodically to introduce new or revised duties or procedures.

Authorized employees shall be trained before their duties are initially assigned. Confined-space awareness training is required once every three years thereafter. This requirement shall be implemented no later than one year after the issue date of this LIR. Training shall also be provided when assigned duties change or whenever a change occurs during an entry operation that presents a hazard for which training has not been provided (e.g., discovery of asbestos, lead, radiation). If there is reason to believe that an authorized employee's knowledge or use of the CSP is inadequate, training shall be revised or developed to correct the deficiencies.

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Two LANL courses shall be mandatory for all authorized employees and qualified persons, regardless of their assigned duties or the hazards of the confined spaces in which they will work. The courses shall be

- Introduction to Hazard Communication and
- Confined-Space Awareness.

All designated qualified persons shall also complete ESH-5 training to ensure their proficiency in evaluating confined spaces in accordance with Section 6.2.1.

Rescue team members shall also require the following (see Section 6, "Emergency Rescue Requirements"):

- current certification in first aid and CPR (for at least one member of the rescue team) and
- initial and annual refresher training involving confined-space rescue field exercises.

Guidance Note: Other training may be required for confined-space-entry operations, e.g., training for monitoring, ventilation, emergency, PPE, or specialized equipment. ESH-5 may be contacted at [click here csp@lanl.gov](mailto:csp@lanl.gov) for further information.

7.0 Required Records

The following records shall be generated and maintained:

7.1 ESH-13

All ESH-13 confined-space training records.

7.2 Safety-and-Environmentally-Responsible Line Manager/Supervisors

- List of entry supervisors and qualified persons.
- Specific written and approved entry procedures with supporting air-monitoring and inspection data for (c) (5) alternate entries (Attachment C).
- Other training as required by Section 6.6.
- Copies of AHAs and/or HCPs for confined-space entries.

7.3 ESH-5

- List of all entry supervisors and qualified persons.
- Confined-space evaluations.
- Entry permits for PRCSSs.

8.0 References

8.1 Documents

ACGIH (American Conference of Governmental Industrial Hygienists). "TLVs and BEIs," Cincinnati, Ohio.

Commodity Specification for Air, CGA G 7.1-1989, Arlington, VA: Compressed Gas Association, (1989).

LANL (Los Alamos National Laboratory), "Signs, Labels, and Tags," Laboratory document LIR 402-100-01, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory), "Stop Work and Restart," Laboratory document LIR 401-10-01, Los Alamos, New Mexico.

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LANL (Los Alamos National Laboratory). "Environment, Safety and Health Training," Laboratory document AR 1-4, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory), "Hazard Analysis and Control for Facility Work," Laboratory document LIR 402-10-01, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory). "Laboratory Training: A Graded and Systematic Approach to a Qualified Workforce," Laboratory document LIR 300-00-04, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory). "Lockout/Tagout for Personal Safety," Laboratory document LIR 402-860-01, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory). "Safe Work Practices," Laboratory document LIR 300-00-01, Los Alamos, New Mexico.

LANL (Los Alamos National Laboratory). "Worker Health and Safety," Laboratory document LPR 402-00-00, Los Alamos, New Mexico.

NIOSH (National Institute for Occupational Safety and Health) 1994. "Worker Deaths in Confined Spaces," DHHS (NIOSH) Number 94-103, Cincinnati, OH.

OSHA (Occupational Health and Safety Administration). "Permit-Required Confined Spaces," Title 29, Code of Federal Regulations, Part 1910.146, Washington, DC.

OSHA (Occupational Health and Safety Administration). Subpart Z, "Toxic and Hazardous Substances," Title 29, Code of Federal Regulations, Parts 1910.1000–1050, Washington, DC.

OSHA (Occupational Health and Safety Administration). "Telecommunications," Title 29, Code of Federal Regulations, Part 1910.268, Washington, DC.

OSHA (Occupational Health and Safety Administration). "Safety and Health Regulations for Construction," Title 29, Code of Federal Regulations, Part 1926, Washington, DC.

Rekus, J. F., 1994. "Complete Confined Space Handbook," National Safety Council, Lewis Publishers, Boca Raton, Florida.

The Roco Corporation, October 1997. "Roco's Confined Space Rescue Compliance Guidelines," Baton Rouge, Louisiana.

8.2 Document Ownership

ESH-5 shall be the OIC for this LIR.

9.0 Attachments

Attachment A NPCS Entry Process Flow Chart
Attachment B PRCS Entry Process Flow Chart
Attachment C Alternate Entry Methods
Attachment D Recommended Major Implementation Criteria for Self-Assessment

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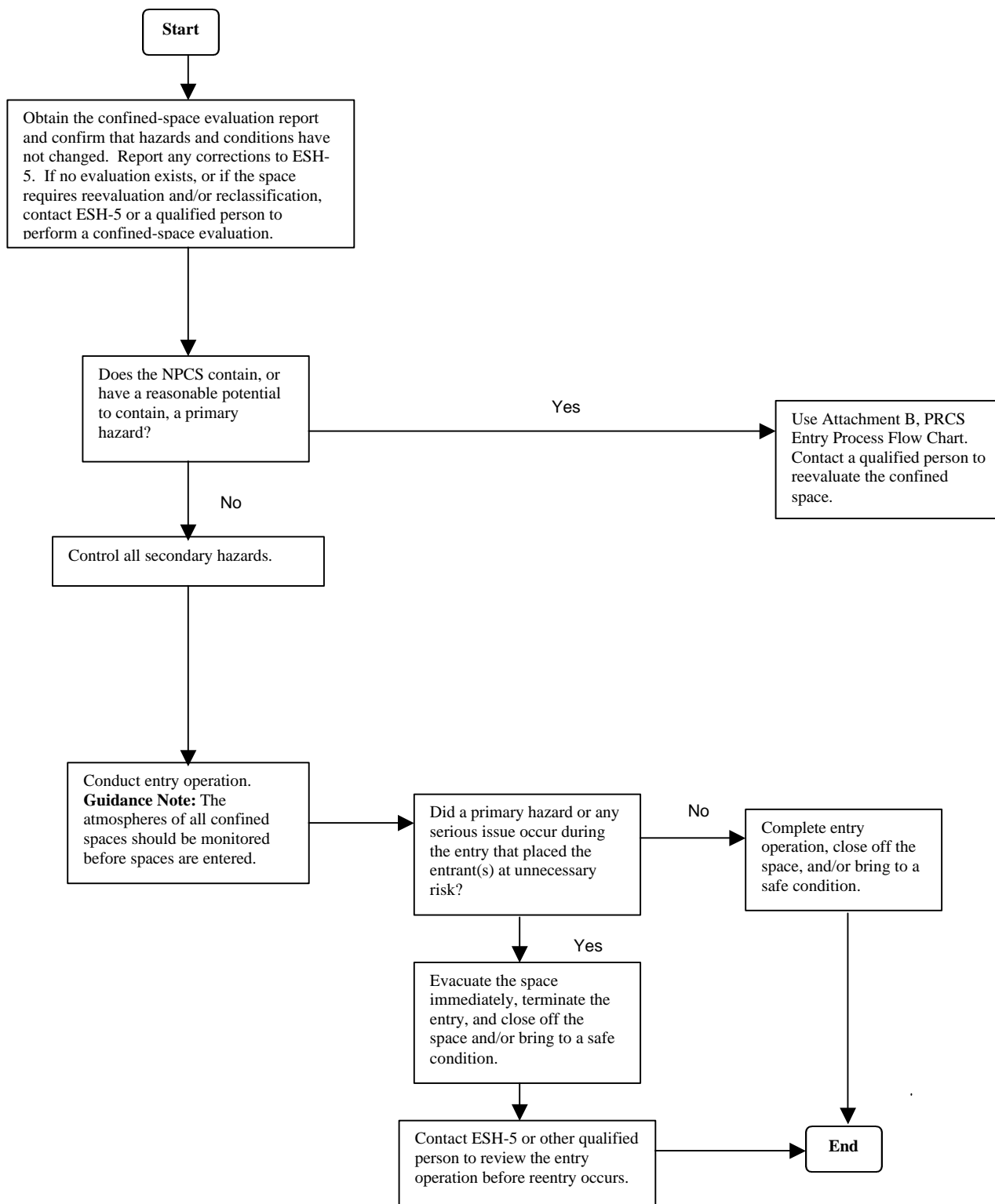
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Mandatory Document

ATTACHMENT A

NPCS ENTRY PROCESS FLOW CHART



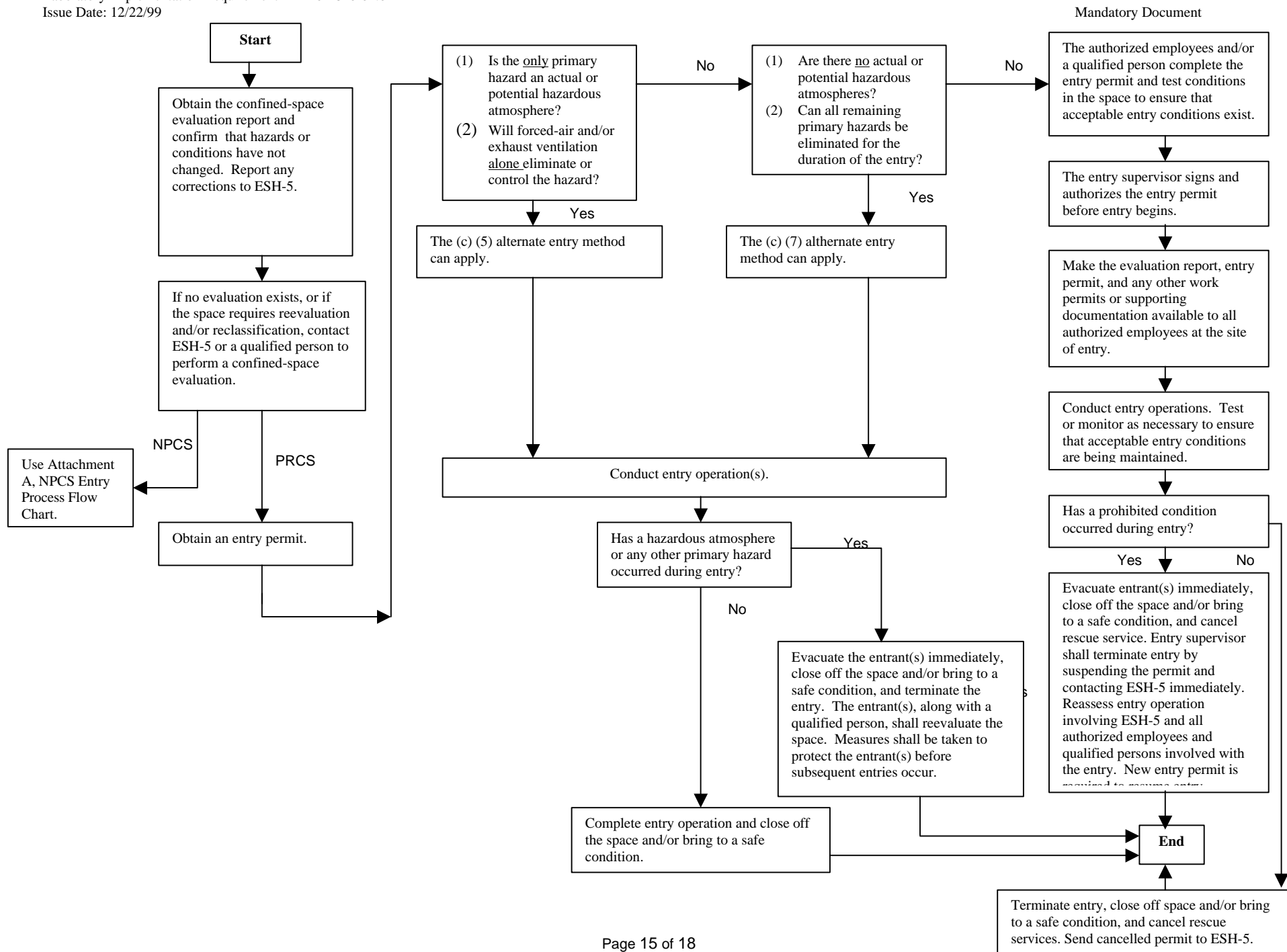
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ATTACHMENT B PRCS ENTRY PROCESS FLOW CHART



ATTACHMENT C

ALTERNATE ENTRY METHODS

C.1 Requirements for (c)(5) Alternate Entry Method

In 29 CFR 1910.146(c)(5), OSHA allows the use of an alternate entry procedure in place of an entry permit, provided that all of the following requirements are met:

- It can be demonstrated that the only primary hazard posed by a PRCS is an actual or potential hazardous atmosphere.
- Continuous forced-air ventilation (or a combination of continuous forced-air and exhaust ventilation) is sufficient to maintain the space safe for entry.
- The immediate safety-and-environmentally-responsible line manager/supervisor develops air-monitoring and inspection data that substantiate the conditions above.
- The PRCS is evaluated by a qualified person with the assistance of a knowledge person.
- If entry is required to obtain initial air-monitoring and inspection data, an entry permit is obtained (see Section 6.3.2, "Permit-Required Confined Space").
- The required determinations and supporting data are documented and made available to entrants who enter a confined space under this alternate entry method.

Entry requirements shall include the following:

- A procedure (i.e., an HCP or AHA) shall be completed. At a minimum, the procedure shall include a section that indicates the date, location of the space, preentry measures and sampling results, and the signature of the authorized employee who verified preentry conditions for each entry.
- Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed. When entrance covers are removed, the opening shall be promptly guarded.
- Before entry, the internal atmosphere shall be tested with a calibrated, direct-reading instrument (see Section 6.3.2, "Permit-Required Confined Spaces").
- Entrants shall have an opportunity to observe preentry testing.
- An authorized employee or qualified person who is trained and proficient in the use of the specific air-monitoring equipment shall confirm that there is no hazardous atmosphere in the space whenever entrants occupy the space.
- Continuous forced-air ventilation or (or a combination of continuous forced-air and exhaust ventilation) shall be used as follows:
 - Entry shall not proceed until the ventilation has eliminated any hazardous atmosphere.
 - Ventilation shall be directed to ventilate the immediate work area(s) within the space.
 - Ventilation shall continue until all entrants have left the confined space.
 - The air supply for the ventilation shall be from a clean source and must not increase the hazards in the space.

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- The atmosphere in the space shall be tested as necessary to ensure that the ventilation is preventing accumulation of hazardous substances in the atmosphere. Entrant(s) shall have an opportunity to observe the periodic testing.
- If a hazardous atmosphere is detected during entry, the entrant(s) shall evacuate the space, immediately close off the space, and/or bring it to a safe condition. Authorized employees and a qualified person shall reevaluate the space to determine how the hazardous atmosphere developed. Measures shall be implemented to protect the entrant(s) before subsequent entry occurs.
- Employees involved in the entry operation shall be trained as authorized employees (see Section 6.6, "Training Requirements").

C.2 Requirements for (c)(7) Alternate Entry Method

An authorized employee may reclassify a PRCS as an NPCS with the entry supervisor's approval, provided that

- the PRCS shall pose no actual or potential atmospheric hazards and
- all nonatmospheric hazards in the space shall be eliminated without entry and shall not reoccur during the entry.

If the space has to be entered to eliminate the hazard(s), entry shall be conducted under an entry permit (see Section 6.3.2, "Permit-Required Confined Space"). If testing and inspection during this entry demonstrate that the hazard(s) in the space have been eliminated, the space may be reclassified as an NPCS for as long as the hazard(s) remain eliminated. Control of hazardous energy sources shall be accomplished by doubleblock and bleeding, blinding or blanking, isolation, or other effective means. Control of atmospheric hazards through forced-air ventilation, or a combination of forced-air ventilation and exhaust ventilation, shall not constitute elimination of the hazards.

Authorized employees shall obtain the corresponding evaluation report and complete Sections A through D of the entry permit to ensure that the primary hazard(s) have been eliminated before entry. If a primary hazard arises during entry, the entrant(s) shall evacuate the space immediately, close off the space and/or bring it to a safe condition, and terminate entry. Authorized employees and a qualified person shall reevaluate the space to determine whether it shall be reclassified as a PRCS before subsequent entries occur.

Employees involved in the entry operation shall be trained as authorized employees (see Section 6.6, "Training Requirements").

ATTACHMENT D

RECOMMENDED IMPLEMENTATION CRITERIA FOR SELF-ASSESSMENT

The major implementation criteria listed below are provided to assist Laboratory organizations in assessing their implementation of this LIR. These criteria provide an objective basis for self-assessing implementation of the major requirements contained in the LIR. The LIR also states requirements in other areas, such as scope, precautions, and responsibilities that, when applied, complement the successful implementation of these major requirements.

1. The most important criteria for assessing the implementation status of this LIR is, "Have the requirements contained in the LIR been communicated to the individuals performing the work?"
2. In addition, the recommended major implementation criteria for self-assessment of this LIR are the following:
 - All known or suspected confined spaces located in their assigned area of responsibility have been identified, evaluated by a qualified person with the assistance of a knowledgeable person, and have been properly posted.
 - Operations involving confined-space entry are conducted only by designated, authorized employees who are trained appropriately and are equipped to perform the work safely.
 - Employee(s) who will perform the duties of entry supervisor are designated.
 - Confined-space operations involving contractors, subcontractors, and vendors are coordinated to ensure compliance with this LIR or an approved CSP or documentation addressing operations. The contractor is debriefed at the conclusion of the operation to determine the effectiveness of the program followed.